

# **MARKHAM**

**VILLAGE**

**water pollution  
control plant**

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ONTARIO WATER RESOURCES COMMISSION  
OFFICE OF THE GENERAL MANAGER

Members of the Markham Village Local Advisory Committee,  
Village of Markham.

Gentlemen:

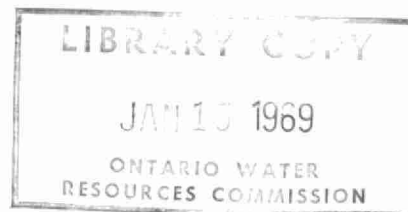
We are happy to present you with the 1967 Operating Summary for the Markham Village Water Pollution Control Plant, OWRC Project Nos. 2-0040-59 and 2-0055-60.

Your co-operation with our staff throughout the year has been appreciated. Only with such co-operation can the war against water pollution be waged effectively.

Yours very truly,

A handwritten signature in dark ink, appearing to read "D. S. Caverly".

D. S. Caverly,  
General Manager.





ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

TELEPHONE 365-

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J. H. H. ROOT, M.P.P.  
VICE-CHAIRMAN

D. S. CAVERLY  
GENERAL MANAGER

W. S. MACDONNELL  
COMMISSION SECRETARY

General Manager,  
Ontario Water Resources Commission.

Dear Sir:

I am pleased to submit to you the 1967 Operating Summary for the Markham Village Water Pollution Control Plant, OWRC Project Nos. 2-0040-59 and 2-0055-60.

The summary reviews progress during the year, outlines operating problems encountered and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

A handwritten signature in dark ink, reading "D. A. McTavish". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

D. A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.

## FOREWORD

● This operating summary has been prepared in order to acquaint readers with the management of the project during 1967. The efficiency of the plant's operation is reflected in a general review. Significant financial details are recorded, and technical performance is illustrated by graphs and charts.

The summary should answer two salient questions. Are the project's facilities adequate at this time? And can the project meet future requirements?

The Regional Operations Engineer is primarily responsible for the preparation of the report, and will be pleased to answer any questions regarding it.

Most of the material for the graphs and charts was compiled by the statistics section of the Division of Plant Operations, with the final versions of the graphs being drawn by the draughting section of the Division of Sanitary Engineering. Cost data were provided by the Division of Finance.

It will be evident from the report that all of these groups co-operated with substantial success.

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**MARKHAM VILLAGE**  
**water pollution control plant**

operated for

THE VILLAGE OF MARKHAM

by the

ONTARIO WATER RESOURCES COMMISSION

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Assistant Director: C. W. Perry  
Regional Supervisor: P. J. Osmond  
Operations Engineer: R. Kauppinen

801 Bay Street        Toronto 5

## **'67** REVIEW

The total operating cost for the plant was \$20,300.68 in 1967, an increase of approximately 13% from \$17,931.30 in 1966. There was, however, a decrease of 12.1% in the cost per million gallons of raw sewage treated from \$102.86 in 1966 to \$90.38 in 1967. The cost per pound of BOD removed increased from 7.3 cents in 1966 to 9.3 cents in 1967.

A total of 224,613,000 gallons of raw sewage was treated in 1967, an increase of 28.8% from the total flow in 1966. The average daily flow in 1967 was 615,000 gallons per day which was considerably in excess of the design flow of 334,000 gallons per day. Thus the plant was severely overloaded hydraulically in 1967.

A total of 108.94 tons of BOD and 151.61 tons of suspended solids were removed from the raw sewage during 1967. The average removal efficiencies for BOD and suspended solids were 66.0% and 66.2% respectively. Due to the severe hydraulic overloading, the OWRC effluent objectives for BOD and suspended solids concentrations were exceeded quite frequently during the year. Approximately 336 cu. ft. of grit were removed from the raw waste in 1967.

A total of 516,832 gallons of raw sludge was pumped to the digester during 1967, and 15,500 gallons of digested sludge were placed on the sludge drying beds.

A total of 9,533 pounds of chlorine was used during the year to maintain the minimum required chlorine residual of 0.5 ppm in the final effluent. Generally, the plant operated well during the year considering the extreme overloading conditions frequently experienced.



## PROJECT COSTS

(2-0040-59 ONLY)

NET CAPITAL COST (Estimated) Long Term Debt to OWRC	<u>\$608,711.07</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1967	<u>\$104,085.63</u>
Debt Retirement	\$ 12,284.00
Reserve	3,060.20
Interest Charged	34,327.30
Net Operating	20,300.68
TOTAL	<u>\$ 69,972.18</u>

### RESERVE ACCOUNT

Balance at January 1, 1967	\$ 17,099.14
Deposited by Municipality	3,060.20
Interest Earned	<u>1,030.04</u>
	\$ 21,189.38
Less Expenditures	<u>-</u>
Balance at December 31, 1967	<u>\$ 21,189.38</u>

## MONTHLY OPERATING COSTS

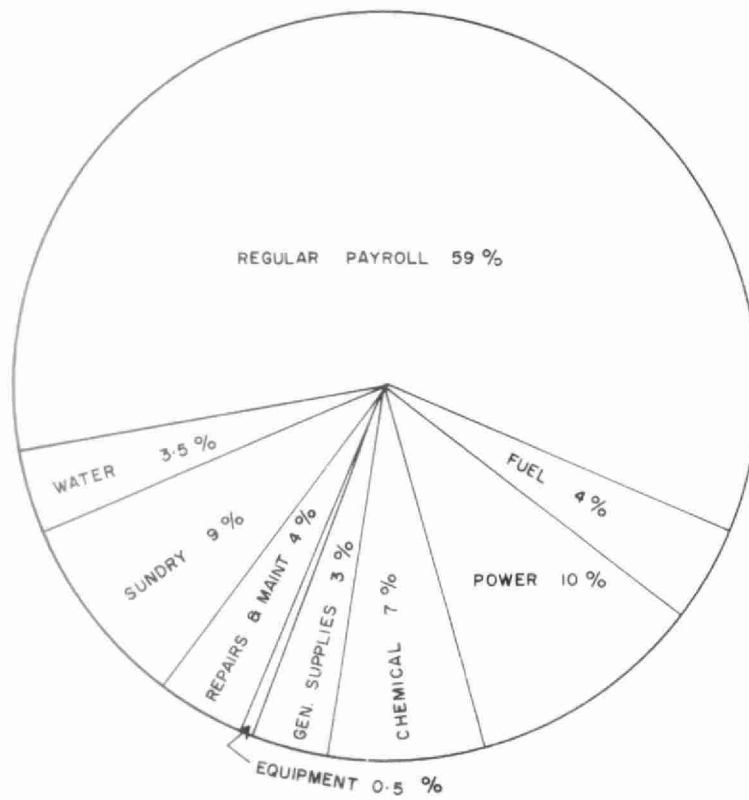
MONTH	TOTAL EXPENDITURE	PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	955.95	798.48	105.75			39.59			12.13	
FEB	1,403.38	779.18		196.53	228.38	8.80		26.51	72.33	91.65
MARCH	2,141.10	1452.50	204.45	195.49		55.90	14.07	131.77	86.92	
APRIL	1,405.73	888.82	103.64	197.21		14.60	63.63	6.38	35.98	95.27
MAY	1,406.26	947.32		187.52	228.38	78.10			18.94	
JUNE	2,469.08	974.58	118.54	195.85	228.38	55.92		161.15	633.66	101.00
JULY	1,298.50	900.17		187.91		46.13			164.29	
AUG	1,760.92	1090.42		183.93	228.38	55.08			29.46	173.65
SEPT	2,109.51	1475.41		189.45		51.55		359.60	33.50	
OCT	1,833.22	909.41	226.50	195.78	228.38	140.24		(7.67)	24.08	116.50
NOV	1,802.59	903.28		185.24	228.38	31.55			454.14	
DEC	1,660.44	897.74	102.98	186.75		63.97		99.14	174.97	134.89
TOTAL	20,300.68	12017.31	861.86	2101.66	1370.28	641.63	77.70	776.86	1740.40	712.96

BRACKETS INDICATE CREDIT

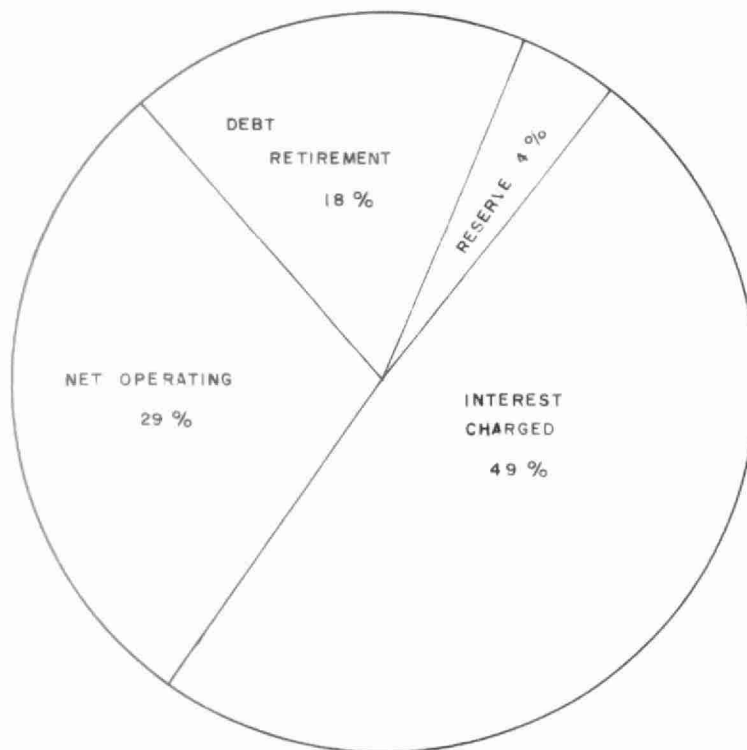
## YEARLY OPERATING COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1961	27.375	\$14395.33	\$525.85	23 CENTS
1962	45.625	\$15920.73	\$348.94	14 CENTS
1963	60.225	\$16771.42	\$276.00	11 CENTS
1964	84.180	\$15120.53	\$179.62	7 CENTS
1965	116.884	\$15909.13	\$136.11	8 CENTS
1966	174.330	\$17931.30	\$102.86	7.3 CENTS
1967	224.613	\$20300.68	\$ 90.38	9.3 CENTS

## 1967 OPERATING COSTS



## TOTAL ANNUAL COST



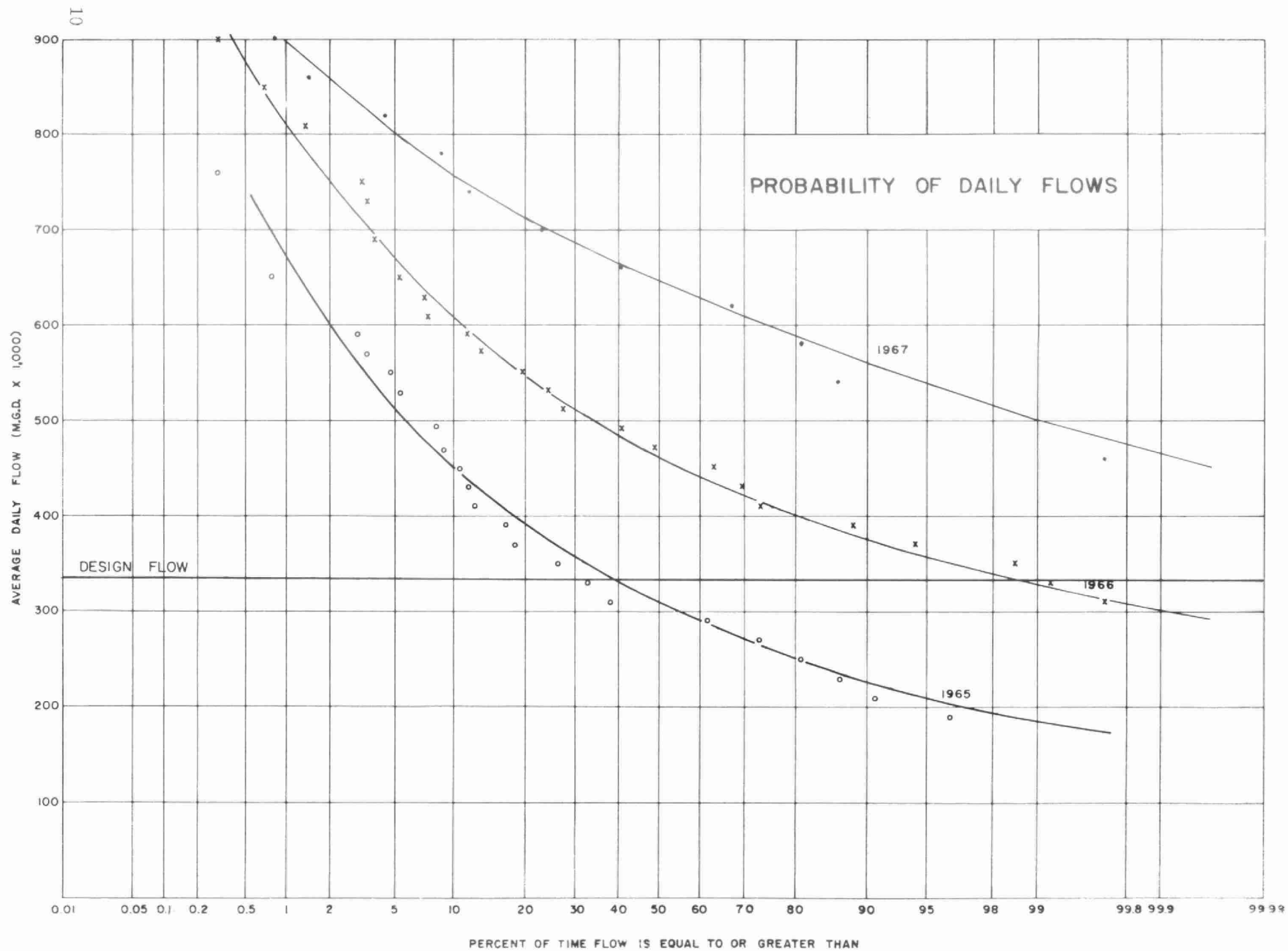
## Process Data

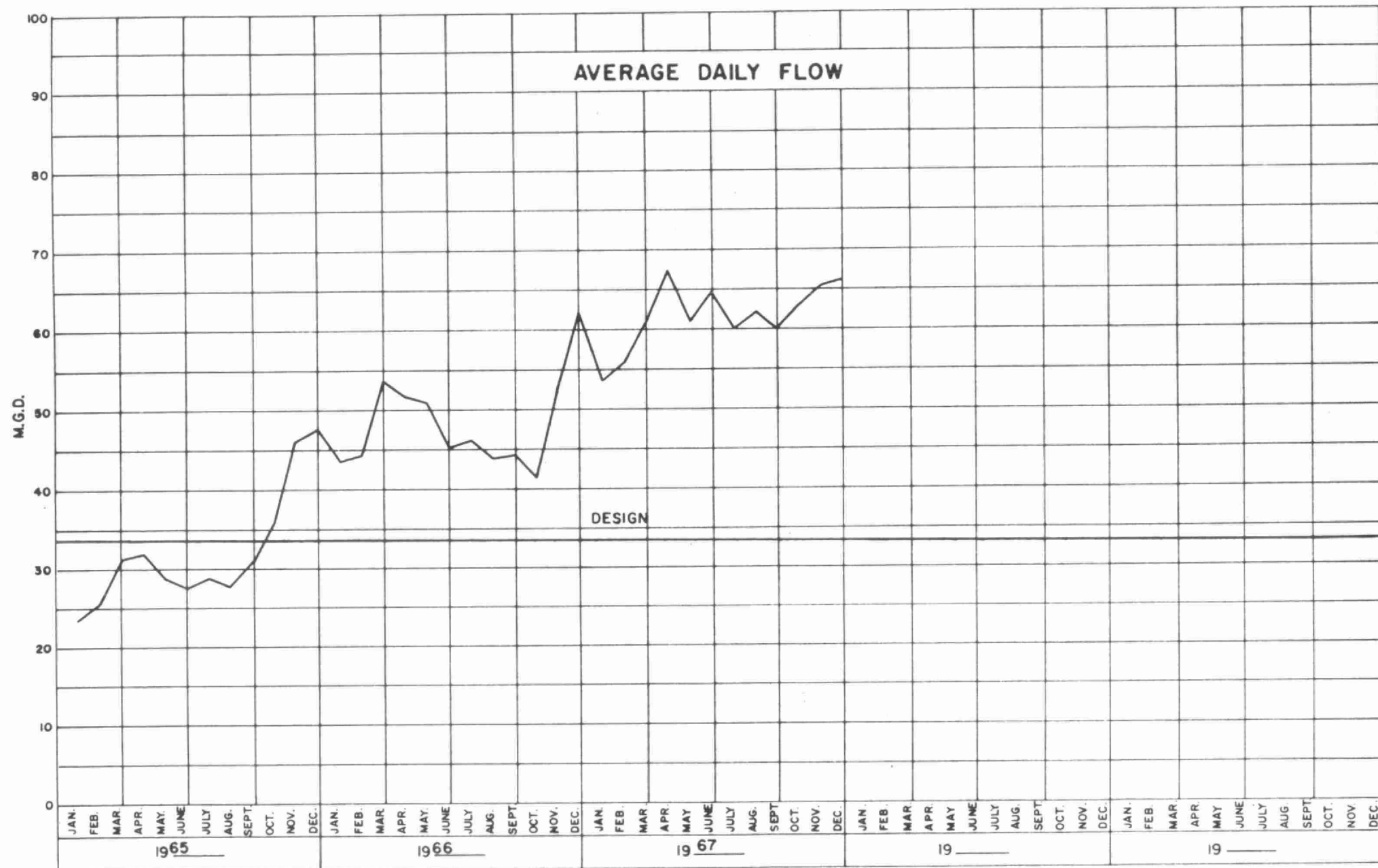
### FLOWS

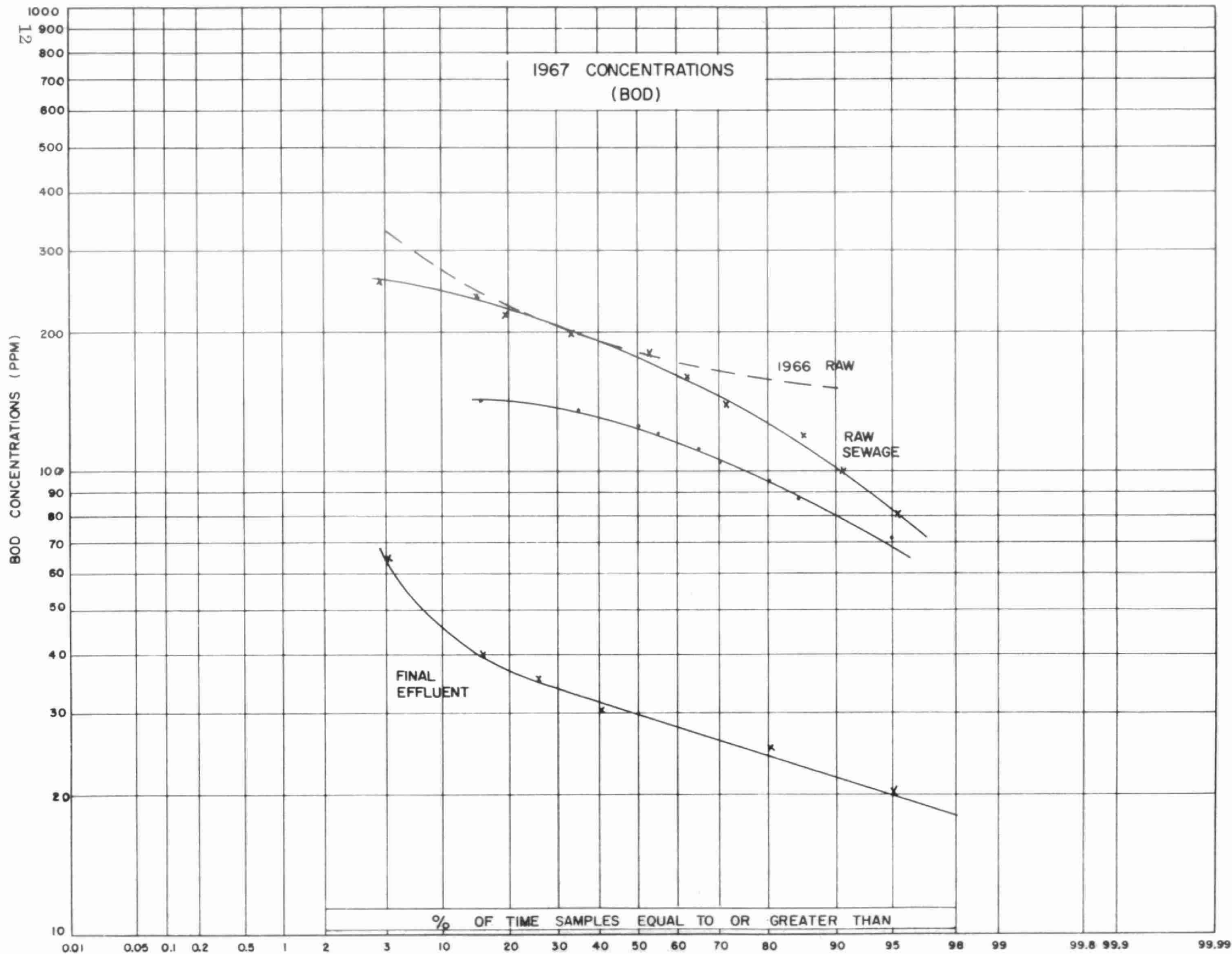
The probability of flow graph indicates that in 1967 the plant design flow of 334,000 gallons per day was exceeded 100% of the time, and that twice the plant design flow was exceeded approximately 62% of the time.

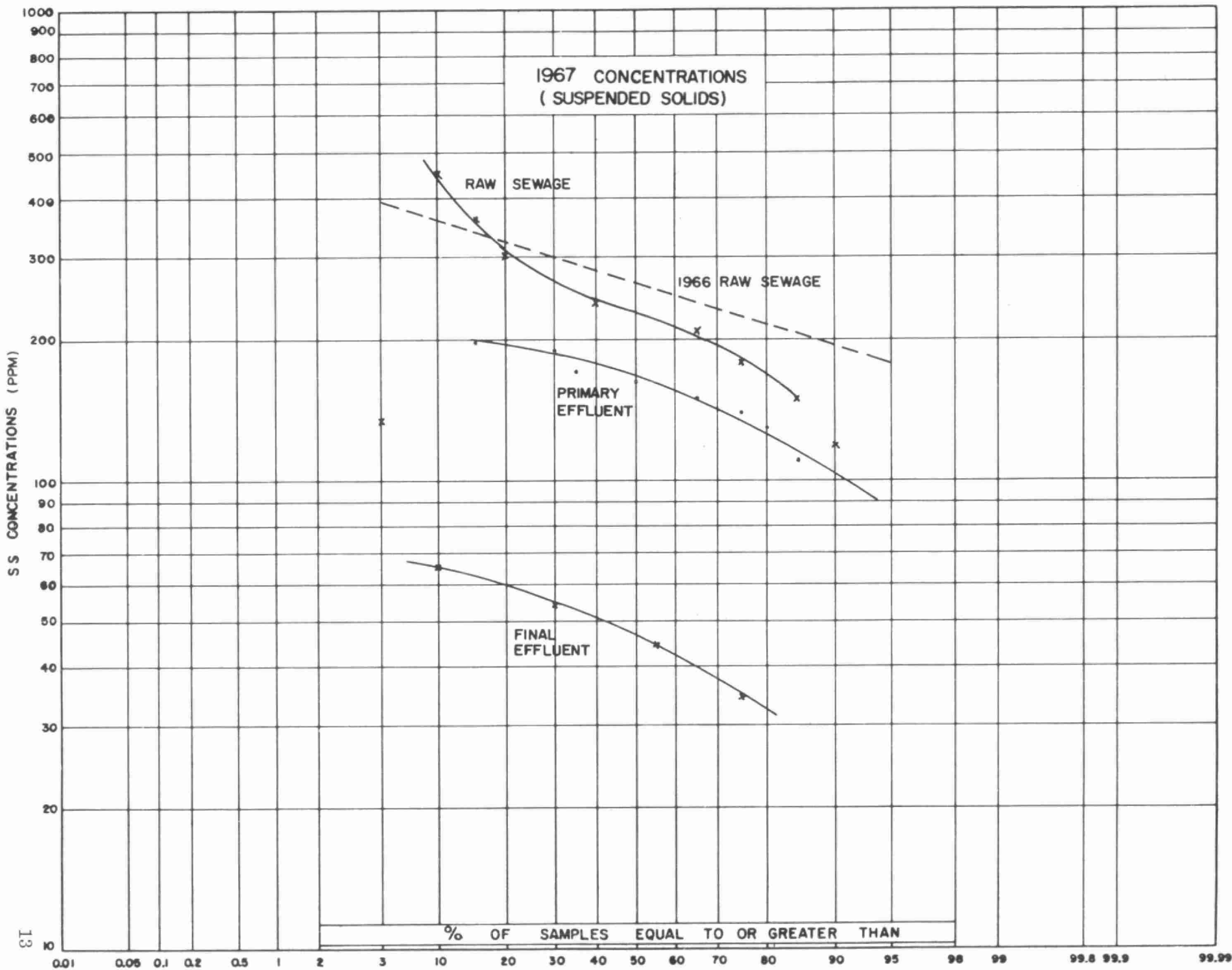
During 1967 the average daily flow was 615,000 gallons per day, an increase of approximately 28.6% from the average daily flow of 478,000 gallons per day in 1966.

These flows indicate that the plant was severely overloaded hydraulically in 1967.

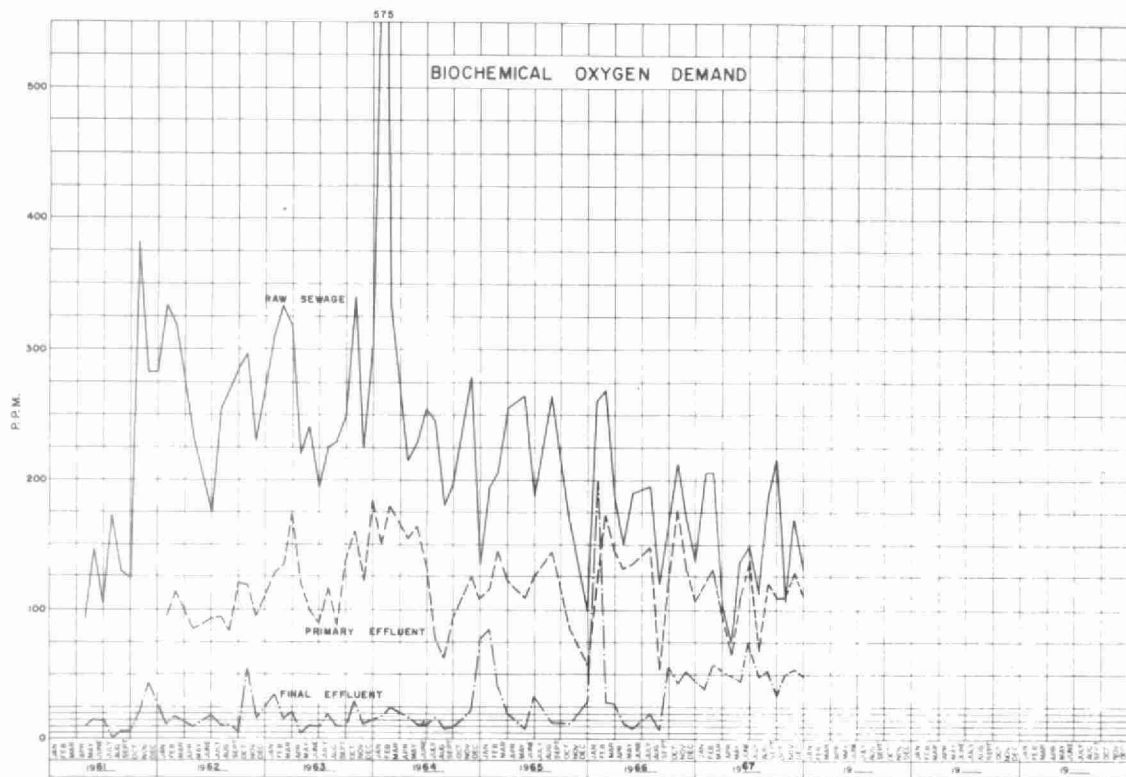




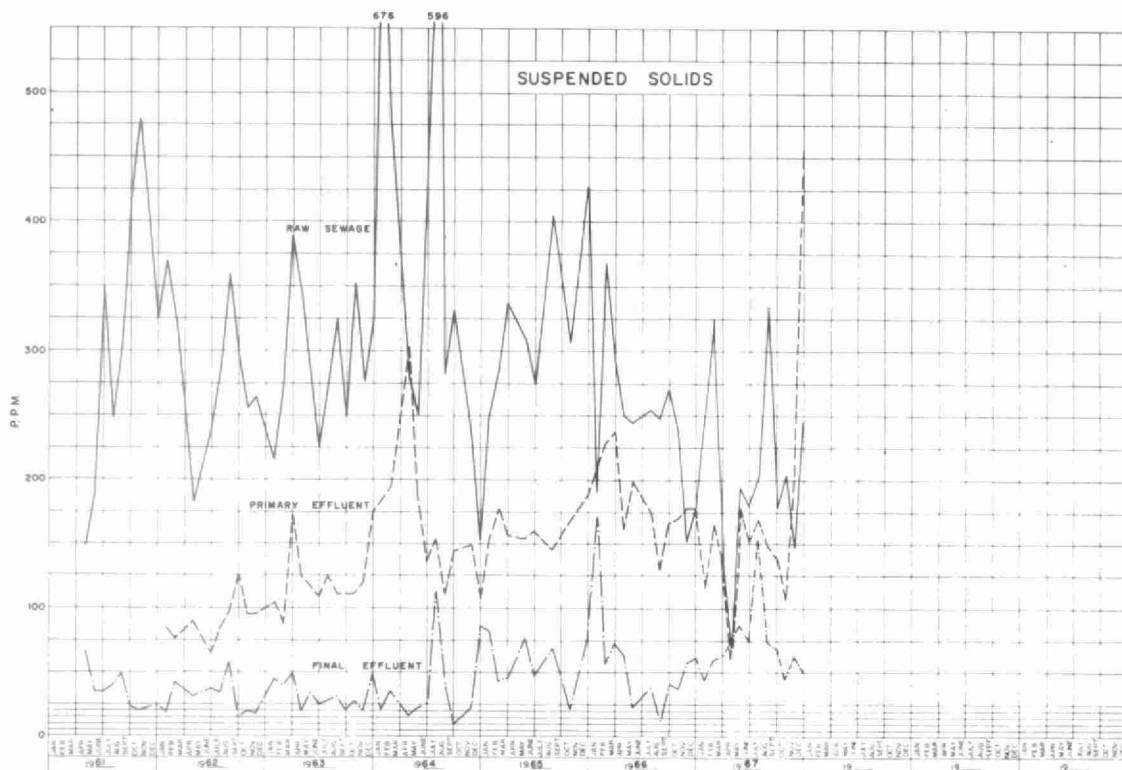








## MONTHLY VARIATIONS



## GRIT, B.O.D AND S. S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU FT
	INFLUENT PPM	EFFLUENT PPM	% REDUCTION	TONS REMOVED	INFLUENT PPM	EFFLUENT PPM	% REDUCTION	TONS REMOVED	
JAN.	205	39	84.9	13.76	250	42	83.2	17.24	30
FEB.	205	56	72.7	11.65	323	56	82.7	20.87	15
MAR.	94	52	44.7	3.95	129	61	52.7	6.40	25
APR.	62	-	-	-	67	-	-	-	18
MAY	137	44	67.9	8.77	194	85	52.5	10.28	32
JUNE	150	74	50.7	7.37	180	74	58.9	10.28	20
JULY	112	47	58.0	6.02	204	152	25.5	4.81	15
AUG.	185	51	70.1	12.87	333	72	78.4	25.07	27
SEPT.	216	33	84.7	16.41	177	60	66.1	10.49	30
OCT.	105	49	53.3	5.47	-	44	0	-	74
NOV.	169	52	69.2	11.44	147	61	58.5	8.41	30
DEC.	129	48	62.8	8.29	245	51	79.2	19.85	20
TOTAL	-	-	-	108.94	-	-	-	151.61	336
AVG.	147	50	65.0	9.08	204	69	66.2	12.63	28

### COMMENTS

A total of 108.94 tons of BOD was removed during 1967. The average BOD concentration of the raw sewage and final effluent was 147 ppm and 50 ppm respectively. These concentrations represent an overall BOD reduction of 66.0%.

A total of 151.61 tons of suspended solids was removed during the year. The average suspended solids concentration of the raw sewage and final effluent was 204 and 69 ppm respectively. These figures represent a reduction in suspended solids of 66.2%.

Considering the severe hydraulic overloading and the fact that a portion of the flow received only primary treatment at the plant, the BOD and suspended solids reductions were satisfactory.

During 1967, 336 cu. ft. of grit were removed from the raw sewage.

## AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. PPM.	MLSS. PPM.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. BOD. REMOVED
JANUARY	120	2297	20	2328
FEBRUARY	132	2836	19	1993
MARCH	92	2253	18	2615
APRIL	66	1538	21	-
MAY	112	2222	22	1993
JUNE	138	1803	35	2163
JULY	69	2000	14	3800
AUGUST	119	2222	24	1770
SEPTEMBER	108	2462	19	1927
OCTOBER	108	2540	19	1836
NOVEMBER	127	2338	25	1619
DECEMBER	109	2754	19	1772
TOTAL	-	-	-	-
AVERAGE	108	2272	21	1984

### COMMENTS

The average primary effluent BOD concentration during 1967 was 108 ppm and the average MLSS (mixed liquor suspended solids) concentration in the aeration tanks was 2,272 ppm. These concentrations represent an average organic loading of the aeration section of 21 pounds of BOD per 100 pounds of MLSS. Generally, this loading is lower than the usual range of loading of 35 to 50 pounds of BOD per 100 pounds of MLSS for conventional activated sludge plants. The average volume of air supplied to the aeration tank was 1984 cubic feet of air per pound of BOD removed.

## DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS		
	GALLONS	% SOLIDS	% VOL MAT	GALLONS	% SOLIDS	% VOL MAT
JAN	90,000	2.00			.64	
FEB	36,500	-	-	-	-	-
MAR	-	-	-	-	-	-
APR	32,860	-	-	-	-	-
MAY	46,400	-	-	-	-	-
JUNE	43,000	-	-	-	-	-
JULY	51,700	-	-	-	-	-
AUG.	54,400	-	-	-	-	-
SEPT.	56,500	5.21	34.54	9940 B	.31	35.48
OCT.	51,200	-	-	-	-	-
NOV.	54,300	1.62	61.11	-	5.67	33.86
DEC.	46,500	5.62	51.06	5560 B	6.22	35.36
TOTAL	516,832	-	-	15500	-	-
AVG	43,069	3.62	48.90	-	3.21	34.90

B - Bed

During February and March, raw sludge was removed from the plant site by tank truck.

### COMMENTS

During 1967 a total of 516,832 gallons of raw sludge was pumped to the digester. Due to the difficulty in starting the digester after the clean-out in 1966, raw sludge was hauled from the plant during February and March. During the remainder of the year, the sludge was pumped to the digester. A total of 15,500 gallons of digested sludge was placed on the drying beds in 1967.

Reduction of volatile matter averaged approximately 44% during the year. Considering that there was some difficulty in starting the digestion process, and that the volatile content of the raw sludge was low, the volatile matter reduction realized in 1967 was adequate.

## CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	16,578	585	3.53
FEBRUARY	15,635	533	3.41
MARCH	18,820	699	3.72
APRIL	20,115	774	3.85
MAY	18,870	884	4.68
JUNE	19,390	824	4.25
JULY	18,515	920	4.97
AUGUST	19,210	900	4.69
SEPTEMBER	17,935	856	4.77
OCTOBER	19,525	849	4.34
NOVEMBER	19,555	836	4.27
DECEMBER	20,465	873	4.27
TOTAL	224,613	9533	-
AVERAGE	18,718	794	4.23

## COMMENTS

A total of 9,533 pounds of chlorine was used to disinfect the final effluent in 1967. This total provided an average dosage rate of 4.23 ppm and was sufficient to maintain the required residual of 0.5 ppm.

Chlorination is practiced year-round at this plant.

LABORATORY LIBRARY



\*96936000119292\*

## CONCLUSIONS

The plant was severely overloaded hydraulically and consequently the final effluent quality was poorer than normally expected from secondary treatment plants. Considering the adverse conditions, the plant staff maintained a clean, attractive and efficient plant.

Plant expansion, to begin in 1968, will alleviate the present severe overload conditions.

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